Nature Conservation

Nature Conservation 62: 5–11 (2026)
DOI: 10.3897/natureconservation.62.184556

Editorial

Wetlands in a changing climate: restoring coasts and floodplains

Ute Susanne Kaden[1], Sophia Schmid[1], Simone Wulf[2], Katrina Marsden[3], Carla Klusmann[3,4], Aletta Bonn[5,6,7], Klement Tockner[8,9], Mathias Scholz[1]

1 *Helmholtz-Centre for Environmental Research (UFZ), Department Conservation Biology & Social-Ecological Systems, Permoserstr. 15, 04318 Leipzig, Germany*
2 German Federal Agency for Nature Conservation (BfN), Division of International Nature Conservation, Konstantinstr. 110, 53179 Bonn, Germany
3 *adelphi research gGmbH, Alt-Moabit 91, 10559 Berlin, Germany*
4 *State Agency for Environmental Protection Saxony-Anhalt, Department Immission Control, Climate, Sustainability, Reideburger Straße 47, 06116 Halle (Saale), Germany*
5 *Helmholtz-Centre for Environmental Research (UFZ), Department Biodiversity and People, Permoserstr. 15, 04318 Leipzig, Germany*
6 *Ecology and Evolution, Institute of Biodiversity, Friedrich-Schiller-University Jena, Dornburgerstrasse 159, 07743 Jena, Germany*
7 *German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstr. 4, 04103 Leipzig, Germany*
8 *Senckenberg - Leibniz Institution for Biodiversity and Earth System Science, Frankfurt/M., Germany*
9 *Faculty for Biological Sciences, Goethe University Frankfurt, Germany*
Corresponding author: Ute Susanne Kaden (ute-susanne.kaden@ufz.de)

OPEN ACCESS

Academic editor: Klaus Henle
Received: 7 January 2026
Accepted: 15 January 2026
Published: 25 February 2026

ZooBank: https://zoobank.org/600667C1-2748-4954-8EF7-489DEC23B832

Citation: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (2026) Wetlands in a changing climate: restoring coasts and floodplains. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 5–11. https://doi.org/10.3897/natureconservation.62.184556

Copyright: © Ute Susanne Kaden et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Wetlands are among Europe's most valuable and biodiverse ecosystems, yet they face significant threats from climate change, pollution, and habitat loss. Their ongoing decline threatens not only biodiversity but also climate stability. Wetlands play a crucial role in mitigating the impacts of climate change, from reducing flood risk to buffering droughts, protecting coasts, and enhancing water resilience, while many also store significant amounts of carbon. They provide a wide range of other essential ecosystem services, such as improving water quality and groundwater recharge, providing food, offering recreational spaces for people, and supporting habitats for numerous species. This is why their protection and restoration are integral to safeguarding both biodiversity and natural life-support systems in the face of a changing climate. However, despite ongoing efforts, wetland loss continues, underscoring the urgent need for more robust and targeted conservation and restoration measures across Europe.

This special issue of Nature Conservation serves as a guide for anyone seeking an integrated understanding of the unique role of European riverine and coastal wetlands in the context of climate change and biodiversity. The focus is intentionally directed toward these often underrepresented wetland types, rather than peatlands, which typically receive most scientific and policy attention. The special issue showcases advancements in both the natural and social sciences, along with a transdisciplinary blend of practical insights from wetland management and policy perspectives.

Drawing on discussions at the 5th European Conference on Biodiversity and Climate Change in Bonn in September 2023, as well as further work from the BioClim-Wetlands project (Kaden et al. 2023), this issue synthesizes a collection of the latest research, case studies, and expert insights. It includes 15 papers authored by 101 experts from 18 countries. Together, they explore key challenges and solutions in wetland conservation and restoration through four thematic sections:

Section I

Wetland biodiversity in a changing climate: understanding their vulnerability

This section assesses the current and projected impacts of climate change on Europe's coastal and riverine wetlands and their biodiversity. It explores the key vulnerabilities these ecosystems face and discusses strategies to increase their resilience. The section opens with a state-of-the-art overview of European wetlands by Kaden et al. (2026a), highlighting their biodiversity value and the mounting pressures they face under climate change, and emphasizing the need to rethink wetlands as multifunctional landscapes. Building on this foundation, Fink et al. (2026) focus on riparian systems, particularly floodplain species, and show how ecological modeling can support climate-smart conservation planning. Complementing this, Ibáñez et al. (2026) highlight the vulnerability of coastal wetlands to sea-level rise and coastal squeeze, stressing the importance of maintaining sediment dynamics and connectivity to enhance long-term ecosystem resilience. Together, these studies underscore the regionally diverse yet interlinked challenges that wetlands face and the importance of adaptive, scale-aware responses.

Section II

Wetland ecosystem services and nature-based solutions for biodiversity and climate

This section explores how European riverine and coastal wetlands deliver essential ecosystem services and how wetland nature-based solutions (NbS) can address both climate mitigation and adaptation goals. It opens with Stammel et al. (2026), who review practical, non-monetary assessment tools for evaluating these services in river floodplains—an important basis for targeted NbS. Building on this, Cvijanović et al. (2026) emphasize that robust biodiversity monitoring is a prerequisite for the reliable assessment of ecosystem services and, ultimately, for effective wetland management. Zak et al. (2026) demonstrate how wetland restoration enhances nutrient retention, an often undervalued regulating service. Next, Ludewig et al. (2026) quantify the substantial potential of wetlands in mitigating climate change through carbon sequestration. Further complementing this wide array of ecosystem services, Wantzen and Cao (2026) explore the deep interconnections between cultural practices and biodiversity in European riverine landscapes, underscoring the necessity of integrating biocultural values and traditional knowledge into wetland conservation and management to sustain both ecological and cultural heritage.

Section III

Wetland restoration in practice: opportunities, overcoming barriers, and scaling up implementation

Building on these scientific foundations, this section turns to concrete experiences from restoration practice across Europe and examines how they can

support wider upscaling. Kmetova-Biro et al. (2026) describe how cooperation along the Danube has improved transnational governance, enabling protected areas to be linked and enhancing ecological connectivity. While this addresses integrated management from a river-basin-wide perspective, de la Vega-Leinert et al. (2026) explore managed realignment in coastal areas as a multifaceted nature-based solution that rethinks hard coastal defense.

Complementing these examples, Birk et al. (2026) draw on 18 demonstration cases across Europe under the MERLIN project to distill five interdependent "building blocks" for upscaling freshwater ecosystem restoration. They show how evidence-based planning, resource mobilization, and stakeholder collaboration can create synergies between scattered pilot projects, supporting systemic landscape transformation. Finally, Macháč et al. (2026) tackle a key barrier to implementation—low awareness of the socioeconomic value of wetland restoration—by valuing ecosystem services and demonstrating clear net benefits for society.

Together, the contributions in this section highlight where we stand today in practical wetland restoration, where we need to go to reach restoration goals, and how we can get there. By presenting real-world case studies and identifying key barriers and recommendations for scaling up restoration efforts, this section provides a roadmap for future actions.

Section IV

Wetlands policy and implementation: enabling a transition towards a resilient future

The final section explores the policy and governance frameworks, as well as the synergies and conflicts, that must be addressed to protect, restore, and sustainably manage wetlands. Beginning with an overview, Klusmann et al. (2026) map the EU policy landscape relevant to wetlands, identifying where existing legislation supports or undermines wetland conservation and restoration, and positioning the new EU Nature Restoration Regulation as a central framework for more coherent and ambitious action across Member States.

Building on this, Rouillard et al. (2026) focus on the Common Agricultural Policy (CAP). By analyzing national CAP Strategic Plans, they assess the extent to which available funds are allocated to reduce drainage, reconnect wetlands, and improve water retention in agricultural landscapes, revealing both promising approaches and missed opportunities. Stoffers et al. (2026) focus on free-flowing rivers as a critical component of Europe's river networks, exploring how biodiversity and climate policies can help protect remaining near-natural rivers and restore degraded systems. The paper addresses definitions, restoration objectives, and practical approaches in light of the EU target to restore at least 25,000 km of rivers to a free-flowing state by 2030.

Overall, the contributions in this section demonstrate that an enabling legal framework for wetland action is in place at the EU level, yet some implementation barriers, inconsistencies, and environmentally harmful incentives persist. Much now depends on the choices Member States make as they implement these policies. The section underlines the importance of capitalizing on the opportunities offered by the EU Nature Restoration Regulation as an overarching law mandating action across ecosystem types and land-use sectors.

In the Conclusion chapter, Kaden et al. (2026b) integrate these insights with ENCA (European Network of Heads of Nature Conservation Agencies) recommendations (ENCA 2023) that outline concrete steps to accelerate wetland restoration across Europe and guide coordinated action across science, practice, and policy.

This special issue invites readers to look beyond the surface and engage with the multifaceted, dynamic world of wetlands. It is not only about scientific knowledge—it is about creating a shared vision for the future of Europe's wetlands, grounded in collaboration, innovation, and an urgent need for action. We hope this issue will serve as a valuable reference for scientists, policymakers, practitioners, and anyone concerned with the future of Europe's wetlands.

Acknowledgments

Bringing together knowledge from diverse disciplines and sectors for this volume has been an inspiring and rewarding journey for us as editors. We are deeply grateful to all authors whose collective expertise and insights made this synthesis possible, as well as to the many practitioners and policy advisors who contributed their real-world perspectives on restoring floodplains and coasts in the face of climate change.

This issue builds on the 5th European Conference on Biodiversity and Climate Change (Bonn, Germany, 2023), organized by the German Federal Agency for Nature Conservation (BfN), the European Network of Heads of Nature Conservation Agencies (ENCA), the Helmholtz Centre for Environmental Research (UFZ), the German Centre for Integrative Biodiversity Research (iDiv), and adelphi. The underlying BioClim-Wetlands project was supported by the Federal Agency for Nature Conservation (BfN) with funds from the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) (Project No. 3521830200).

We sincerely thank all conference participants for their inspiring discussions, which shaped the direction of this volume. We also thank the peer reviewers for their valuable and constructive comments and the Nature Conservation publishing team for their helpful guidance throughout the process. Finally, we are grateful for the expertise, energy, and experience of the many wetland scientists, practitioners, policy advisors, and volunteers who made this volume possible.

Let us move forward together to advance wetland action in Europe!

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Use of AI

No use of AI was reported.

Funding

Supported by the Federal Agency for Nature Conservation (BfN) with funds from the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) as part of the project BioClim-Wetlands (Project No. 3521830200).

Author contributions

All authors have contributed equally.

Author ORCIDs

Ute Susanne Kaden https://orcid.org/0000-0003-3167-959X
Sophia Schmid https://orcid.org/0000-0002-2554-0797
Simone Wulf https://orcid.org/0009-0006-4222-0652
Katrina Marsden https://orcid.org/0000-0002-3611-2878
Aletta Bonn https://orcid.org/0000-0002-8345-4600
Klement Tockner https://orcid.org/0000-0002-0038-8151
Mathias Scholz https://orcid.org/0000-0002-8463-9500

Data availability

All of the data that support the findings of this study are available in the main text.

References

Birk S, Anzaldua G, Baattrup-Pedersen A, Bérczi-Siket A, Blackstock K, Buijse T, Carmen E, Carvalho L, Garcia X, Gerner N, Grondard N, Hernandez Herrero E, Ibrahim A, Kok S, Lenz M-I, Nyírő F, Okruszko T, Penning E, Pott L, Rouillard J, Schmidt-Kloiber A, Schwerk A, Sommerhäuser MM, St. John R, Waylen K, Hering D (2026) Building blocks for upscaling freshwater ecosystem restoration: Place-based strategies for a transdisciplinary challenge. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 261–287. https://doi.org/10.3897/nature-conservation.62.148938

Cvijanović D, Stammel B, Novković M, Adamescu M, Baumane M, Bonn A, Ehlert T, von Gönner J, Januschke K, Kaden US, Schipper C, Schulz-Zunkel C, Scholz M (2026) Towards effective and integrated riparian wetland monitoring in Europe: challenges and opportunities. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 121–148. https://doi.org/10.3897/naturecon-servation.62.167089

de la Vega-Leinert AC, Esteves LS, Andreu-Boussut V, Quinio L, Chadenas C, van Loon-Steensma JM, van den Hoven K (2026) Managed re-alignment: a multifaceted approach in ecological restoration of coastal floodplains. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 237–260. https://doi.org/10.3897/natureconservation.62.148691

ENCA (Network of Heads of Nature Conservation Agencies) (2023) Restoring Riverine and Coastal Wetlands in Europe. Scaling Up Action for Biodiversity and Climate, 7 pp. https://www.encanetwork.eu/fileadmin/inhalte/enca/pdf/2023_enca-recommenda-tions-wetlands.pdf

Fink S, Kräuchi N, Stofer S, Weber A, Horchler PJ (2026) Conservation planning for riverine biodiversity under changing climate: use of models. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 47–62. https://doi.org/10.3897/natureconservation.62.149645

Ibáñez C, Caiola N, Elphick CS, Grillas P (2026) To what extent is coastal wetland biodiversity endangered by climate change? How can we boost the resilience of coastal ecosystems? In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 63–94. https://doi.org/10.3897/natureconservation.62.154795

Kaden US, Scholz M, Buijse, Anthonie D, Cvijanović D, Froese I, Diack I, Duffield S, Ibáñez C, Jähnig SC, Januschke K, Ludewig K, Marsden K, Müller P, Rodríguez-González PM, Schulz-Zunkel C, Stadler J, Stammel B, Wantzen KM, Weber A, Wulf S, Zak D, Bonn A, Bundesamt für Naturschutz (2023) Discussion Paper; June 2023 Riverine and coastal wetlands in Europe for biodiversity and climate. Deutschland / Bundesamt für Naturschutz. https://doi.org/10.19217/HGR233EN

Kaden US, Schmid S, Vieweg M, Scholz M, Dufour S (2026a) European riverine and coastal wetlands under pressure: biodiversity and climate change. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 13–45. https://doi.org/10.3897/natureconservation.62.163636

Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M, Duffield S (2026b) Restoring coasts and floodplains - Conclusions and recommendations for enabling action across science, policy, and practice. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 383–391. https://doi.org/10.3897/natureconservation.62.184559

Klusmann C, Brotherton P, Schiller T, Wulf S, Marsden K (2026) Wetlands in the EU policy context. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 317–335. https://doi.org/10.3897/natureconservation.62.163780

Kmetova-Biro E, Rožac V, Frank G, Marušić M, Lagutov V (2026) Bridging protected areas along the Danube. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 217–236. https://doi.org/10.3897/natureconservation.62.160887

Ludewig K, Shupe HA, Vásconez Navas LK, Mueller P, Nolte S, Hunt CA (2026) Case studies from Germany and Scotland indicate climate change mitigation potential of riverine and coastal wetlands. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 149–173. https://doi.org/10.3897/natureconservation.62.153910

Macháč J, Zaňková L, Hekrle M, Scholz M (2026) Nature-based solutions with sponge functions: socio-economic importance and valuation. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 289–315. https://doi.org/10.3897/natureconservation.62.164530

Rouillard J, Meier J, Blackstock KL, Matthews KB, Birk S (2026) Does the Common Agricultural Policy 2023–2027 support the restoration of freshwater ecosystems? In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 337–354. https://doi.org/10.3897/natureconservation.62.148845

Stammel B, Jähnig SC, Mehl D, Pusch M, Srđević Z, Tschikof M, Wulf S, Scholz M (2026) Assessing ecosystem services across scales to support nature-based solutions in river floodplains: a review of non-monetary tools. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 95–119. https://doi.org/10.3897/natureconservation.62.148716

Stoffers T, Schultze A-K, Ehlert T, Kaiser L, Scholz M, Nagelkerke LAJ (2026) Challenges and opportunities in restoring European free-flowing rivers. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 355–381. https://doi.org/10.3897/natureconservation.62.173762

Wantzen KM, Cao Y (2026) Cultural practices in European riverine floodplains: formation, typology, co-decline of biocultural diversity, and emerging drivers of conservation and sustainable management. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 195–215. https://doi.org/10.3897/natureconservation.62.156771

Zak D, Tschikof M, Natho S, Jes Petersen R, Kronvang B, Hoffmann CC, Liu H, Wang M, Kaden US (2026) Floodplains and coastal wetlands as nutrient sinks: a restoration perspective. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 175–193. https://doi.org/10.3897/natureconservation.62.158302